MONTHLY WEATHER REVIEW.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for January, 1903, is based on data from about 3300 stations, classified as follows:

Weather Bureau stations, regular, telegraph and mail, 160; West Indian service, cable and mail, 8; River and Flood service, rainfall only, 49, river and rainfall, 162; voluntary observers, domestic and foreign, 2565; total Weather Bureau Service, 2944; Canadian Meteorological Service, by telegraph and mail, 20, by mail only, 13; Meteorological Service of the Azores, by cable, 2; Meteorological Office, London, by cable, 8; Mexican Telegraph Company, by cable, 3; Army Post Hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Company, 96; Hawaiian Meteorological Service, 75; Jamaica Weather Service, 130; Costa Rican Meteorological Service, 25; The New Panama Canal Company, 5; Central Meteorological Observatory of Mexico, 20 station summaries and printed daily bulletins and charts, based on simultaneous observations at about 40 stations; Mexican Federal Telegraph Service, printed daily charts, based on about 30 stations.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Territorial Meteorologist, Honolulu, H. I.; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Lieut. Commander W. H. H. Southerland, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San José, Costa Rica; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. M. Shaw, Esq., Secretary, Meteorological Office, London; Rev. Josef Algué, S. J., Director, Philippine Weather Service; and H. H. Cousins, Chemist, in charge of the Jamaica Weather Office.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′, or $10^h\ 30^m$ west of Greenwich. The Costa Rican standard of time is that of San José, $0^h\ 36^m\ 13^s$ slower than seventy-fifth meridian time, corresponding to $5^h\ 36^m$ west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

The month opened with a barometric disturbance of slight energy off the Texas coast. Moving northeastward, with increasing strength, this low pressure reached the lower Lake region on the morning of the 3d, and during that day it united on the New England coast with a storm of considerable intensity that apparently developed over the Carolinas during the 2d, and moved thence northeastward during the night of the 2–3d, attended on the middle Atlantic and south New England coasts by wind velocities of 30 to 48 miles an hour. Advisory messages in connection with this storm were telegraphed Atlantic ports from Hatteras to Eastport on the evening of the 2d, and warnings for high southeast winds were displayed on the Maine coast on the morning of the 3d.

The first important storm of the month on the Great Lakes advanced from the British Northwest Territory to the extreme upper Mississippi Valley during the 5th and 6th, with reported minimum barometric pressure 29.03 inches at St. Paul, Minn., at 8 p. m. of the 6th. During the 7th this storm moved south of east over the Lake region with barometer 29.02 inches at Grand Haven, Mich., at the morning report, and by the morning of the 8th had reached Nova Scotia. At 12:06 p. m. of the 8th the following message was cabled Lloyds, London:

> Severe storm will pass eastward from Newfoundland to-night.

The highest wind velocity reported in connection with this disturbance was 56 miles an hour at Cleveland, Ohio, during the night of the 7–8th. Snow fell generally from the upper Mississippi Valley over the Lake region and Ohio Valley, New York, and New England during the 7th, and a moderate cold wave swept southward over the central valleys and the Gulf States during the 7th and 8th, carrying the line of freezing temperature to the middle Gulf coast and northern Florida by the morning of the 9th. The snow, gales, and low temperature of this period were amply covered by the forecasts and special warnings.

The severest storm and cold wave of the month visited the central, southern, and eastern districts from the 10th to the 13th. This storm first assumed definite form over the lower valley of the Colorado River during the night of the 8th, and moved thence to the west Gulf States during the 9th and 10th with gradually decreasing barometric pressure. During the 11th the disturbance moved rapidly northeastward to the St. Lawrence Valley, attended by snow in northern and rain in southern districts east of the Mississippi River, and followed by clearing and much colder weather. On the morning of the 12th the line of zero temperature reached the Ohio River, and freezing temperature occurred to the middle coast of the Gulf of Mexico. By the following morning the line of freezing temperature had reached Tampa, Fla., and a minimum reading of 28° was noted at Jacksonville. On the Great Lakes a maximum wind velocity of 60 miles an hour, from the west, occurred at Buffalo, N. Y., and on the Atlantic coast a

maximum velocity of 60 miles an hour was reported at New York, N. Y., during the night of the 11th. The snow, gales, cold wave, and frost of the 11th to 13th were covered by the regular morning and evening forecasts and special warnings. Moving eastward over Newfoundland during the 12th, with barometric pressure below 29.00 inches, the storm reached the British Isles on the 16th. At 10:45 a. m. of the 12th the following message was cabled to Lloyds, London:

Severe storm will move eastward over Newfoundland to-day followed by a cold wave.

The most important storms of January, 1903, on the Pacific coast occurred in the third decade of the month. During the night of the 23d the barometer fell rapidly on the north Pacific coast and to 29.38 inches at Port Crescent, Wash. During the 24th the storm center moved inland over the British Northwest Territory with a barometer reading of 29.00 inches at Kamloops at the evening report, and high southwest winds and heavy rain prevailed along the Washington, Oregon, and northern California coasts. This disturbance rapidly lost energy during the 25th and practically dissipated over the Lake region during the 26th. The approach of another disturbance from the Pacific Ocean was indicated by evening reports of the 25th; on the morning of the 26th this storm was central over western Oregon. By the morning of the 27th, and during that and the following day, a depression of great magnitude extended from the middle Rocky Mountain districts to the middle and north Pacific coast. During the 28th this depression centered over eastern Colorado. During the next two days the storm center advanced, with a marked increase in intensity, over the Lake region and Ohio Valley, attended during the night of the 29th and on the 30th by gales of 40 to 60 miles an hour on the Great Lakes, and during the 30th and 31st by northwest gales along the middle Atlantic and New England coasts.

BOSTON FORECAST DISTRICT.

The month was unusually tempestuous, severe gales, with rain and snow, being of common occurrence along the coast. The most severe storms were those of the 10–11th, 17–18th, 20th–21st, and the 24–25th, the winds being from easterly quarters and of great force. Violent westerly gales were also of frequent occurrence. A noticeable feature of the high winds was their continuance, some of the gales lasting two or three days. Storm warnings were issued on fifteen days, and all were fully justified, excepting probably one. Beyond great delay, little damage resulted to shipping, which was doubtless due to the ample and timely warnings. The Bureau was highly commended for its excellent work.—*J. W. Smith, Forecast Official.*

NEW ORLEANS FORECAST DISTRICT.

The weather during January was generally mild. Frost or temperature warnings were issued for the sugar and trucking interests in the coast section on the 2d, 5th, 6th, 7th, 8th, and 12th. Cold-wave warnings were issued for Louisiana and eastern Arkansas on the 11th. Storm warnings were issued on the 23d and advisory warnings were issued of brisk to high winds for the benefit of the small craft engaged in the oyster and fishing industry on the 11th, 21st, 26th, and 29th. Subsequent conditions showed that all warnings were justified.—*I. M. Cline, Forecast Official.*

CHICAGO FORECAST DISTRICT.

Advisory messages were sent to all open ports from time to time during the month in advance of impending windstorms. As no casualties occurred, it is thought that the information was of considerable advantage. The most severe and dangerous storm during January was one which advanced southeastward from the British Northwest Territories and reached the Lake region the night of January 6–7. This storm continued with considerable force for a period of thirty-six hours. Another severe storm advanced eastward from the Rocky Mountains on the 28th and 29th, increasing in force during the latter date and on the morning of the 30th. Marine interests were warned of the approach of both these storms.

No severe cold wave overspread the forecast district during the month, but the most general one was that which moved from the British Northwest Territories southward and eastward during the 28th, 29th, and 30th, for which warnings were issued in advance. Cold-wave warnings were ordered at a few stations on other dates, but not generally throughout the district.—*H. J. Cox, Professor.*

DENVER FORECAST DISTRICT.

The prevailing mild weather during January was interrupted by only one cold wave, and that of local character and short duration. Light precipitation was a feature; traffic on the mountain railroads was not interrupted.—*F. H. Brandenburg, Forecast Official.*

SAN FRANCISCO FORECAST DISTRICT.

The month can be readily divided into two essentially different types of pressure distribution. From January 1 until the 18th a seasonal high covered the western half of the country, and in this forecast district use was made of this knowledge to anticipate a period of dry weather with northerly winds, relatively low temperatures, and much tule fog in the great valley. From January 19 to the 31st entirely different seasonal pressure distribution occurred and rain or snow with continued southeast winds covering many days was anticipated.

On January 5 the map offered an excellent illustration of the conditions prevailing when the valleys of California are full of fog (tule fog). The surface temperatures ranged from 36° to 40°, while on the peaks and foot hills bright sunshine prevailed with temperatures 10° higher. At San Francisco the temperature was 42°, maximum, 52°; at Mount Tamalpais, 53°, maximum, 62°. It is interesting to note that these conditions lasted for several days. South of the Tehachapi unusually warm weather prevailed. As illustrating the contrast the following table may be cited:

Station.	Maximum.	Station.	Maximum.
Los Angeles	80°	Red Bluff	40°
San Luis Obispo	80	Sacramento	40
San Diego	76	Fresno	42

At the same moment, 5 p. m. January 5, there was a difference of 19° in temperature between San Francisco and Mount Tamalpais—14 miles away.

The fog continued in the great valley with little interruption for more than two weeks, moving slowly from the valley to the sea. On January 11 and subsequent dates the unusual conditions of killing frost and dense fog were reported at points in the valley.

A southwest storm warning was hoisted at San Diego on January 15 at 6 p. m. and was verified.

From January 19 to the end of the month storm warnings were displayed almost continuously on the northern coast of California. On January 21 the rainfall at Eureka from 10:25 p. m. of the 20th to 9:05 p. m. of the 21st amounted to 5.10 inches, being the greatest precipitation in any twenty-four consecutive hours since the establishment of the station.

High southwest winds prevailed in Nevada on January 24 to 26.

The rivers of the Sacramento Valley rose rapidly on January 27, but except at Colusa did not pass the danger line. Information of expected rise was sent nightly to the Colusa Sun.

A cold wave for northern Nevada on January 29 was not